

CHAPTER 7 - ELLIOTT BAY SUBBASIN CONSTRUCTION IMPACTS

This chapter describes the impacts in the Elliott Bay Subbasin from construction of Phases 2 and 3/4 for both the Preferred Alternative and Alternative 2. Alternative 2 - No Action would not require construction; therefore, it would produce no construction impacts and is not included in this chapter.

In compliance with 40 CFR Part 6, potential environmental impacts have been analyzed. There are no wetlands, floodplains, important farmlands, national natural landmarks, wild and scenic rivers, or barrier islands within or adjacent to the project area. Potential impacts in the Elliott Bay Subbasin to historic, archaeological, and cultural sites; air resources; fish and wildlife; and endangered species are discussed where applicable in this chapter. Consistency of the project with City of Seattle Shoreline Master Program has also been evaluated and is included in this chapter and Chapter 5.

Impacts associated with any of the project alternatives are generally divided into two categories: impacts related to short-term construction activities and impacts associated with the long-term operation of the proposed CSO control facilities. The impacts associated with construction of the project are caused by construction in streets, spoils removal, transport of construction materials, disruption of parking, and other temporary activities required for construction.

Construction-related impacts of alternatives would depend to a great extent on the timing and duration of construction activity associated with the selected alternative. Table 7-1 shows the estimated construction duration for each element of each facility in the Elliott Bay Subbasin by alternative. A construction schedule would be developed for the selected alternative that would take into account a number of factors: availability of funding, timing of property acquisitions and permits, extent of environmental mitigation required, and the ability to coordinate with other public projects.

Construction in the Elliott Bay Subbasin is estimated to take approximately 3.5 years to complete with construction at the Elliott West site taking about 3 years and at the outfalls about 7 months. Cumulative impacts are discussed in Chapter 9. Mitigation measures to mitigate adverse impacts are provided in Chapter 10.

7.1 EARTH RESOURCES

The Elliott Bay Subbasin contains areas of steep slopes and sensitive soils which are highly susceptible to erosion. Under both alternatives construction activity would result in short-term impacts to earth resources. Excavation of soils during construction could result in erosion of excavated or stockpiled material. Table 7-2 summarizes the excavation volumes in the Elliott Bay Subbasin for both alternatives. A temporary increase in runoff turbidity at construction sites is anticipated, particularly at large-scale excavation sites. The potential for encountering contaminated soils exists during construction. Some contaminated soils may be suitable for reuse as backfill material. Some areas in the subbasin may be prone to liquefaction during a strong seismic event.

Table 7-1
Elliott Bay Subbasin Facilities
Construction Duration

Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

(* Same facility for Both Alternatives)

<u>Type of Facility</u>	<u>Element</u> (months of construction for element)	<u>Months of Construction</u>
Outfalls	Elliott West Outfall and Denny Way CSO Outfall Extension	7
Conveyance	Elliott West Effluent Pipeline (5) Elliott West CSO Pipeline (5)	8
Regulating Structures	Elliott Bay Interceptor Control Structure(4) *Denny Way Diversion Structure (4)	4
CSO Control	<u>Elliott West CSO Control Facility</u> <i>Mercer Street Tunnel (23)</i> <i>West Tunnel Portal (11)</i> <i>Floatables Control Channel (6)</i> <i>Influent Pump Station (12)</i> <i>Chemical Storage and Feed Facility (12)</i>	38

Alternative 2 - Partial Separation and Storage

(* Same facility for Both Alternatives)

<u>Type of Facility</u>	<u>Element</u> (months of construction for element)	<u>Months of Construction</u>
Outfalls	Elliott Bay Stormwater Outfalls (2)	2
Conveyance	Elliott Bay Stormwater Pipelines (35) Elliott Avenue Pipeline (5)	40
Regulating Structures	*Denny Way Diversion Structure (4)	4
CSO Control	<u>Denny CSO Control Facility</u> <i>Storage Tank (24)</i> <i>Influent Pump Station (12)</i> <i>Effluent Pump Station (12)</i>	46

Table 7-2
Elliott Bay Subbasin
Estimated Volumes of Excavated Material¹
(in cubic yards)

	Alternative 1	Alternative 2
Outfalls	5,000	1,700
Elliott West Outfall	5000	--
Denny Way CSO Outfall Extension	(incl. above)	--
Elliott Bay Stormwater Outfalls	--	1700
Conveyance	45,400	308,650
Elliott West Effluent Pipeline	21,900	--
Elliott West CSO Pipeline	23,500	8650
Elliott West Stormwater Pipelines	--	300,000
Elliott Avenue Pipeline		
Regulating Structures	650	650
Denny Way Diversion Structure	650	650
		--
CSO Control	127,500	50,500
Mercer Street Tunnel and West Tunnel Portal	95,000	--
		--
Elliott West CSO Control Facility	32,500	50,500
Storage Facility/Pump Station	--	
Total Excavated Volume	178,550	361,210

¹ Numbers include only excavation volumes and not bedding or backfill materials.
A 20 percent swell factor is included except for tunnel spoils which include a 50 percent swell factor.

7.1.1 Alternative 1 - CSO Storage and Treatment (The Preferred Alternative)

Outfalls

Onshore construction of the Elliott West Outfall and the Denny Way CSO Outfall Extension would use typical cut-and-cover methods. Offshore construction would involve setting concrete pilings for support and to protect the pipelines from settlement and lateral ground displacements, and a concrete mattress to cover the pipes. Spoils volumes for the two outfalls would total approximately 5,000 CY. Offshore construction of the two outfalls would occur in the same trench. Construction of the outfalls would result in temporary disturbance in the intertidal zone. Offshore equipment utilized during construction would include derrick barges, several flat barges, tug boats, and work boats. Contaminated sediments could be encountered during excavation off-shore, particularly in the area shoreward and on the existing sediment cap. Contaminated sediments would be handled according to the contaminated soils and groundwater handling plan prepared prior to construction. Myrtle Edwards Park and the area immediately offshore would be prone to liquefaction during a large seismic event.

Conveyance

Construction of the Elliott West Effluent Pipeline and Elliott West CSO Pipeline using cut-and-cover techniques would generate spoils volumes of approximately 45,000 CY. Erosion could occur when soils are exposed during construction. As with the excavation of other facilities, there is the potential to encounter contaminated materials. These materials would be handled in the same method as described previously.

Regulating Structures

The Denny Way Diversion Structure would be constructed east of Myrtle Edwards Park. Major dewatering would be necessary to keep the excavation free of standing water. Construction would generate approximately 650 CY of spoils.

CSO Control

The 6,3100 feet of 14.5-foot finished, inside-diameter tunnel would be constructed from west to east using the tunnel boring method described in Chapter 3. The West Tunnel Portal would be located west of Elliott Avenue West on the Elliott West site. The construction area at the west portal would be fairly large to accommodate loading facilities and haul trucks. Material excavated from the tunnel would be hauled through the west portal using muck cars on rails. Spoils volumes from tunnel excavation are estimated to be approximately 95,000 CY. It is possible that some excavated soils could be contaminated (see general discussion of contaminated soils). Clean soils could be used for backfill or hauled to other construction sites for use as clean fill material.

Because sensitive soils are located along the proposed tunnel route, construction activities, such as dewatering, could result in ground movements, particularly in the vicinity of the tunnel portal. The remainder of the portal trench would be shored during construction to provide a stable excavation.

Construction of the CSO control facilities on the Elliott West site would generate spoils volumes of approximately 32,500 CY of material. Dewatering and sheetpiling would probably be necessary during

construction. Dewatering on the Elliott West site could result in salt water intrusion. As described in Section 4.1.6.1, there are contaminated soils on the Elliott West site in the vicinity of the railroad tracks. Additional contaminated soils encountered on the site during construction would be handled according to the contaminated soils and groundwater handling plan prepared prior to construction. Impacts from construction of pump stations on the Elliott West site would be similar to those from construction of storage tanks. Large scale excavations would probably require shoring and dewatering, and could result in erosion and an increase in runoff turbidity at construction sites. The CSO control facility is located in a Seismic Zone 3 with high liquefaction potential.

7.1.2 Alternative 2 - Partial Separation and Storage

Outfalls

Four new stormwater outfalls would extend offshore to the MLLW mark in Elliott Bay. Some minor disturbance of sediments would occur during construction. Approximately 1,700 CY of spoils would be generated.

Conveyance

The installation of 14 miles of new stormwater pipelines using cut-and-cover techniques would generate spoils volumes of over 300,000 CY. Erosion could occur when soils are exposed during construction. As with the other types of excavation, the potential exists to encounter contaminated soils. Short-term impacts from construction of the Elliott Avenue Pipeline are similar to Alternative 1, except the increase in length of pipelines require more spoils disturbance so has a higher potential to encounter contaminated soils.

Regulating Structures

Impacts from construction of the Denny Way Diversion Structure are the same as discussed for Alternative 1.

CSO Control

Impacts from construction of the storage tank would be similar to those described for the South Lake Union CSO Control Facility under Alternative 2. Spoils volume is estimated to be approximately 50,500 CY.

7.2 AIR RESOURCES

7.2.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Alternative 1 would require construction of a new outfall transition structure and the Elliott West Effluent Pipeline. The transition structure would be located in Myrtle Edwards Park, while the force main would parallel the existing railroad tracks adjacent to the park. Construction would occur over a

seven-month period during normal working hours using open-trench construction, resulting in potential impacts to a wide range of receptors including users of the park and occupants of adjacent business. Impacts would be temporary, including potential dust and exhaust fumes from construction vehicles. Offshore construction activities associated with outfall extension and construction would not create any significant air quality impacts. Diesel fumes and exhaust from construction vessels and equipment would be generated; however, these fumes would be readily dispersed in the open waters of Elliott Bay and Puget Sound, minimizing impacts to any receptors along the shoreline.

Conveyance

The West Tunnel Portal would be located on the site of the Elliott West CSO Control Facility on the west side of Elliott Avenue. Spoils materials from tunnel excavation would be stored onsite. Construction could affect receptors in the area including residents of buildings near the site, businesses along Elliott Avenue, and users of adjacent parks. During peak periods of construction, dust and exhaust fumes would be noticeably elevated in these areas. Methane deposits also could be encountered during construction of the Mercer Street Tunnel, and specific methods for assuring the health and safety of workers would be an integral part of air supply and ventilation systems for the tunnel. Most conveyance pipelines would be constructed using open trenches. Pipeline construction would occur over approximately eight months, and dust and vehicle emission impacts would be highly localized along the construction route. Receptors in the area include users of Myrtle Edwards and Elliott Bay parks as well as commercial businesses along Elliott Avenue immediately to the north, south and east of the project site. Impacts would be temporary and intermittent. While at times the impacts would be noticeable, they would not present a significant impact.

Regulating Structures

The Denny Way Diversion Structure would require excavation adjacent to Myrtle Edwards Park. Construction of the diversion structure would likely result in intermittent, noticeably higher levels of dust and exhaust fumes to users of Myrtle Edwards Park and adjacent businesses. These impacts would be temporary.

CSO Control

Excavation and construction at the Elliott West CSO Control Facility would result in short-term impacts from the generation of dust and the use of construction equipment. An area 160 feet by 130 feet would be excavated to a depth of 93 feet, and the site would be used for spoils storage and transfer during construction of the Mercer Street Tunnel. During peak construction activities, increased levels of dust and vehicle exhaust fumes would be noticeable to businesses along Elliott Avenue, motorists, condominium residents, and park users.

7.2.2 Alternative 2 - Partial Separation and Storage

Outfalls

Alternative 2 would require construction of four new stormwater outfalls in Myrtle Edwards Park and/or Elliott Bay Park. Construction would occur over a two-month period. Depending on final location, installation of the outfalls could deter park users by generating dust and vehicle exhaust.

However, park users would be diverted away from construction sites through signage, and impacts would be temporary and localized. No significant impacts would occur.

Conveyance

The Elliott Avenue Pipeline proposed under Alternative 2 would be installed using an open trench. Construction of the pipeline parallel to existing railroad tracks adjacent to the park would most likely occur on a similar time schedule as the Denny Way Diversion Structure proposed for Alternative 1, requiring approximately four months. Pipeline construction would occur during normal working hours, resulting in temporary and localized generation of dust and vehicle emissions. Myrtle Edwards Park users may be temporarily aware of increased dust and odors, however, park users would be diverted away from construction areas. Impacts would end following project completion.

Widespread short-term impacts would occur under Alternative 2. Approximately 14 miles of new stormwater pipeline would be constructed throughout the subbasin over a 35-month period. This construction would result in temporary and localized generation of dust and vehicle exhaust at various sites throughout the subbasin. Areas bounded by Western Avenue, Battery Street, Fourth Avenue North and Virginia Street as well as Alaskan Way, Seventh Avenue North, Howe Street, Queen Anne Avenue, Denny Way, and Cedar Street would be subject to construction. These areas include high density commercial and residential areas, creating the potential to expose many individuals to increased levels of dust and vehicle exhaust.

Regulating Structures and CSO Control

Denny Way Diversion Structure impacts would be the same as discussed under Alternative 1. Elliott West CSO Control Facility impacts would be similar to those presented under Alternative 1. Impacts could be of greater magnitude due to the proposed increased storage capacity of the control facility.

7.3 WATER RESOURCES

The potential for encountering contaminated groundwater exists during construction. Dewatering of excavations may be required under both alternatives and may temporarily affect groundwater levels and result in settlement in the vicinity of excavation sites. Groundwater pumped from excavations would likely be turbid and would be discharged to the local combined sewer.

7.3.1 Alternative 1 - CSO Storage and Treatment (The Preferred Alternative)

Outfalls

Surface Water. Localized water quality impacts would occur with construction of the Elliott West Outfall and the Denny Way CSO Outfall Extension. During placement of the pilings, existing sediments would be disturbed, creating localized increases in turbidity. Increased turbidity would occur in the vicinity of the construction throughout the duration of in-water construction. Contaminants contained within the sediments could be re-introduced to the water column in the vicinity of the Denny Way Sediment Cap associated with construction of both the outfall and outfall extension. Previous studies identified elevated levels of contaminants in intertidal sediments located just offshore of the Denny Way CSO. In particular, elevated levels of

polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) were identified. In an effort to remediate contaminated sediments in 1990, Metro capped contaminated sediments in the intertidal area offshore of the Denny Way CSO with three feet of clean sand. Long-term monitoring has indicated that the sediment cap has been successful in isolating contaminated bottom sediments (Metro 1995). Construction within the sediment cap would have the potential to introduce previously capped sediments into the water column. Of particular concern would be PCBs and PAHs, as well as metals and oxygen-demanding compounds. It would be necessary to meet numerous permitting requirements prior to construction and design would be closely coordinated with regulatory agencies, including Ecology and WDFW, as well as the U.S. Army Corps of Engineers (refer to Chapter 10, Mitigation Measures). Agency concerns would likely focus on the potential for reduced dissolved oxygen levels in the vicinity of the construction site and the potential for contaminated fine sediments to slowly settle out of the water column in the construction vicinity. Permit conditions could limit construction to periods when sensitive biological activity (e.g., juvenile salmonid migration) is low.

Groundwater. Outfall construction would have no impacts on groundwater, as construction would occur in Elliott Bay.

Conveyance

Surface Water. Construction of conveyance components would result in the potential for additional solids loading to Elliott Bay during intense storm events.

Groundwater. Deeper excavations for the Elliott West Effluent Pipeline and Elliott West CSO Pipeline would likely encounter local groundwater. Groundwater depths in the area are shallow, and dewatering could be required during construction. Withdrawing groundwater could locally reduce groundwater levels and temporarily alter flows. However, due to the depth of excavations, it is unlikely that substantial amounts of dewatering would occur, and no impacts related to ground subsidence would be expected. Groundwater withdrawal associated with dewatering adjacent to Elliott Bay also could result in local saltwater intrusion depending on the duration of dewatering, tidal influence, groundwater gradients, depths of dewatering wells, and other factors.

Regulating Structures

Surface Water. Construction of the Denny Way Diversion Structure would generate potential construction related impacts similar to those described below at the Elliott West CSO Control Facility. However, the potential magnitude of impact is lower than that described for the conveyance components, because the extent of exposed surface area is much less and duration of construction for this facility is expected to be less.

Groundwater. The Denny Way Diversion Structure would require excavation to a depth of 15 feet. Impacts to groundwater would be similar to those discussed above under conveyance.

CSO Control

Surface Water. The greatest potential impact would be erosion associated with construction of the Mercer Street Tunnel. The Elliott West site would be used for materials stockpiling, including excavation spoils storage. Large volumes of excavated materials would be stored at the site. However, because much of the construction would be below the grade of surrounding street surface, most of this material would remain on-site. Materials attached to construction vehicles as they travel to and from the site could reach Elliott Bay via overland flow during storm events. Impacts would last throughout the duration of construction. Impacts would not be significant, assuming implementation of appropriate erosion control measures to avoid off-site transport of soils/sediments. Construction of the Elliott West CSO Control Facility would have similar potential impacts to those described for the Mercer Street Tunnel. Approximately 3.5 to 4 acres of surface area would be exposed during excavation for the facility. It is likely that on-site measures to reduce erosion would not be completely effective, therefore, some off-site transport of soils or sediments would be expected to occur. This material could be discharged to Elliott Bay. Because most of the excavation would occur below the subsurface, and erosion control measures would be implemented to minimize potential for off-site transport of sediments, this impact is not expected to be significant.

Groundwater. Construction for the Mercer Street Tunnel and West Tunnel Portal would likely intercept local groundwater. Construction of the Elliott West CSO Control Facility would require excavation of an area 160 feet by 130 feet to a depth of 93 feet. To excavate the Mercer Street Tunnel, equipment capable of handling high groundwater levels would be used. If groundwater conditions are elevated, dewatering from the surface using wells could occur during tunnel construction. Substantial amounts of dewatering could be required during construction of these facilities. Impacts would be similar to those discussed above but would be of greater magnitude due to the greater area and depth of excavation. Lowering of groundwater levels could result in settlement of fill soils, potentially impacting buildings, roads, or other overlying structures (Brown and Caldwell and KCWPC 1996). If sheet or cylinder pile walls are used for shoring, the potential for groundwater seepage into open excavations could be reduced, reducing the need for dewatering outside the sheet pile wall. Saltwater intrusion also could occur at the Elliott West site depending on the duration of dewatering, tidal influence, groundwater gradients, depths of dewatering wells, and other factors. No areas of contaminated groundwater have been identified in the vicinity of the Elliott West site, but could require treatment before disposal if encountered.

7.3.2 Alternative 2 - Partial Separation and Storage

Outfalls

Surface Water. Construction of four new stormwater outfalls in Elliott Bay would generate short-term, localized water quality impacts. Localized increases in turbidity would occur in the construction zone, along with potential localized increased levels of oxygen demand. Because construction would occur in nearshore areas where deposition of contaminated sediments has been documented (Metro 1995), there may be the potential to reintroduce contaminated sediments into the water column. As described for Alternative 1, the Denny Way Sediment Cap is located offshore from the Denny Regulator; stormwater outfall construction at this location could potentially disrupt capped sediments. Impacts associated with disrupting capped sediments would

be similar to those described for Alternative 1. A number of permits would be necessary for outfall construction, including a Hydraulic Project Approval from the Washington Department of Fish and Wildlife, as well as a Shoreline Substantial Development Permit from the City of Seattle, and applicable permits from the U.S. Army Corps of Engineers. In order to obtain these permits, it would be necessary to develop construction methods with the lowest likelihood of disrupting contaminated sediments and ensure that negative impacts to Elliott Bay aquatic life would be minimized. Construction scheduling would be timed to avoid periods sensitive to fisheries.

Groundwater. No groundwater impacts are expected from construction of stormwater outfalls. Outfall construction would be limited to the immediate Elliott Bay shoreline.

Conveyance

Surface Water. Construction of Elliott Bay Stormwater Pipelines would result in potential construction impacts similar to those described for Alternative 1. Because the construction area is significantly larger than that described for Alternative 1, the potential magnitude, duration, and geographic distribution of impacts are greater for Alternative 2.

Groundwater. Groundwater could be encountered during construction of the Elliott Avenue Pipeline. Impacts would be similar to those discussed under Alternative 1. No significant impacts to groundwater are expected associated with stormwater pipeline construction. The potential for encountering groundwater during excavation for stormwater pipelines is lower compared to the project conveyance facilities as these pipelines are smaller in diameter and would not require deep excavation. No significant impacts are expected.

Regulating Structures

Construction related impacts to surface water and groundwater from the Denny Way Diversion Structure are the same as described under Alternative 1.

CSO Control

Surface Water. No tunnel would be required for Alternative 2, but an storage tank would be constructed at the Elliott West site. Approximately 1.5 to 2 additional acres of surface area would be required for the storage facility as compared to the treatment facility proposed in Alternative 1, with accompanying increased potential for off-site soil transport.

Groundwater. Impacts would be similar to Alternative 1, but could be slightly greater due to the proposed increased storage capacity accompanying increased excavation of the control facility.

7.4 BIOLOGICAL RESOURCES

7.4.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Plants, Wildlife and Habitat. The shoreline habitat along Myrtle Edwards and Elliott Bay parks was identified as a “focus area” or high-priority site for wildlife habitat restoration under the Elliott Bay/Duwamish Restoration Program in 1993 (Metro 1993). However, underwater surveys off the shoreline shows that soft bottom sediments are not conducive for habitat improvements; therefore, improvements along these park shorelines has since been canceled (Romberg 1996). Habitat restoration goals outlined in the Elliott Bay/Duwamish Restoration Program would not therefore be affected by proposed outfall construction.

Little information is known regarding existing aquatic plants or marine animals found within the vicinity of the existing Denny Way CSO. However, preliminary underwater surveys have been done in Myrtle Edwards Park by the WDFW as part of the Elliott Bay/Duwamish Restoration Program (Buckley and Bookheim 1996). Macro-algae, including *Nereocystis leutekeana* (kelp), *Gigartina exasperate*, and *Sarcodiotheca* species, were the only plant species reported off shore from Myrtle Edwards Park. Removal of kelp and other aquatic macro-algae may occur during construction within the estimated 0.7 to 0.9 acre area of bottom sediments that would be disturbed. However, much of the impacted area lies below the littoral zone and is not anticipated to support kelp or other aquatic plants. Major kelp beds or eelgrass beds have not been identified or recorded for this area of Elliott Bay, according to the *Puget Sound Environmental Atlas* and other sources (Evans-Hamilton and D.R. Systems 1987; EVS Consultants 1995).

In addition to aquatic plants, a number of planted trees and shrubs within Myrtle Edwards Park could be removed on shore during outfall construction. Concrete construction would require shore-based concrete trucks and concrete pumps (Brown and Caldwell and KCWPC 1996). Trees and shrubs would be removed, if necessary, to accommodate these construction elements. Outfall construction would also result in temporary impacts to habitat for marine mammals, waterfowl, and urban wildlife found in Myrtle Edwards Park. Trenching and other near-shore activities associated with construction of the two outfalls would likely require an estimated seven months to complete. During pipeline trenching, forage areas and travel corridors used by marine mammals (i.e., harbor seals, sea lions, orca whale, and river otter) may be adversely affected in the vicinity of Myrtle Edwards Park in Elliott Bay. Each of these marine mammals has been observed in Elliott Bay, although sightings of orca whale have been infrequent and limited to the outer edges of the bay (Tanner 1991). In addition, Dall’s porpoise have been observed in the outer bay approximately four miles north of Elliott Bay Park (EVS Consultants 1995). In their notification letter regarding federally-listed species (Appendix G), the National Marine Fisheries Service (NMFS) listed that Stellar’s sea lion, humpback whale, and leatherback sea turtle may occur in Puget Sound. Due to the urban environment, use of the area by these species is rare, and special studies are not necessary (Meyer 1996). Therefore, the project is not likely to adversely affect these listed species.

Since marine mammals feed largely on salmon, these animals are more likely to be found along the shorelines of Elliott Bay during periods of adult salmon migration. As discussed in Section 10.4,

the WDFW may set seasonal time limits for in-water construction in Elliott Bay to avoid and/or minimize construction impacts to salmon during adult and/or juvenile migration and adult spawning periods. Construction of the outfalls would likely be limited to a seasonal construction window during which juvenile salmon are not actively migrating. Consequently, marine mammals may be feeding less actively along the shoreline during the construction window set by WDFW. Although not formally designated as a sea lion haul-out area in the *Puget Sound Environmental Atlas* (Evans-Hamilton and D.R. Systems 1997), sea lion pups occasionally haul out and rest on the small natural beach located at the north end of Myrtle Edwards Park. This natural sand beach is located approximately 500 feet north of the existing Denny Way CSO Outfall. One sea lion pup was observed resting on this beach during field surveys undertaken for this project in 1995. Use of this informal haul-out area may be temporarily disturbed during the outfall construction period.

A large number of waterfowl species, gulls, and other pelagic birds use Elliott Bay waters for foraging and many of these bird species congregate near the existing Denny Way CSO. These bird species would likely be displaced from their normal feeding grounds during the construction period. Temporary increases in surface water turbidity during outfall construction and increased noise during pile driving and other activities centered on floating barges would likely result in local disturbance of waterfowl use along the shoreline in Myrtle Edwards Park. Urban wildlife residing in Myrtle Edwards and Elliott Bay parks would also be temporarily displaced due to on-shore construction activities located within and near these parks. Staging, trenching, and other onshore activities are likely to disturb wildlife use of the park during construction. Wildlife and birds commonly occurring in the park are gray squirrels, rats, glaucous-winged gull, pigeons, starling, crow, and American robin.

Federally-listed threatened and endangered species such as bald eagle and peregrine falcon, respectively, have been documented as flying within the Elliott Bay area. Marbled murrelet, also a federally-listed threatened species, may occur within Elliott Bay. Bald eagle are not anticipated to be affected by construction activities associated with the outfalls under Alternative 1. The closest eagle nests are located approximately three miles north in Discovery Park and approximately two miles southwest on Duwamish Head (above Salty's Restaurant) (WDFW 1995). These eagles are known to forage within a large area encompassing Elliott Bay, Lake Union, Lake Washington and the Duwamish waterway. The USFWS would not require a biological assessment for bald eagle.

Peregrine falcon routinely use the Port of Seattle grain terminals and piers for perching sites (Deal and Muller 1994). Peregrine falcon frequently feed on pigeons congregating along the Burlington Northern/Santa Fe Railroad tracks near the grain terminal. The USFWS has been contacted with regard to the possible adverse affects of the Denny/Lake Union Project on peregrine falcons in Seattle. The USFWS does not require a biological assessment for possible disturbance to peregrine falcon since these birds are adapted to the urban environment and feed upon pigeons which occur throughout the City of Seattle (Watkins 1996b). No adverse affects on peregrine falcon are anticipated by the USFWS for construction of this project.

Marbled murrelet have been identified by the USFWS as a listed species which may occur in the vicinity of this project (USFWS 1996). Consultation with the USFWS is complete and a determination was made that adverse effects would not be likely from construction of this project, including outfalls, on these sea birds (see Appendix G). Marbled murrelets are not documented within the Seattle harbor area (WDFW 1995), but are known to forage regularly off of Alki and

West Point (Harris 1996). Any marbled murrelets in the vicinity of Myrtle Edwards shoreline would likely relocate to less disturbed and more productive habitats nearby. No mature or old growth forests are present near the proposed outfalls, therefore, there is no potential for disruption of murrelet nesting habitat during construction. The USFWS has concurred that the project is not likely to adversely affect marbled murrelets and a biological assessment is not required (see Appendix G).

Fisheries. Under Alternative 1, outfall construction could result in temporary, minor impacts to fish habitat and species. Overall, approximately 0.7 to 0.9 acres of bay floor sediments would be disturbed over the course of outfall construction; however, the use of pilings to support the outfalls would reduce disturbance of the sediment cap. In-water outfall construction would occur over approximately seven months. This period includes avoidance of construction in intertidal and shallow subtidal zones from mid-March to mid-June corresponding to juvenile salmonid out migration (Mori 1996). Any juvenile salmon occupying nearshore nursery areas in the project vicinity would not be impacted as construction activity would be avoided during juvenile out migration periods in compliance with WDFW HPA permit requirements. Excavation would disturb and resuspend bottom sediments, temporarily increasing turbidity in the immediate vicinity of construction activities. Small finfish along the pipeline trench would be disturbed because of high turbidity. However, these impacts would be temporary and, depending on current and tidal conditions during construction, sediments would quickly settle or be dispersed by currents. Noise and the presence of vessels associated with construction activity also could temporarily displace fish in the project area, but these fish would reoccupy the area after construction is completed.

Outfall construction would also require disturbance of the existing Denny Way Sediment Cap located offshore from the present outfall. Potential concerns exist relating to resuspension of potentially toxic substances. Juvenile salmonids may be particularly sensitive to toxic compounds. Outfall construction would not significantly affect tribal and recreational fishing in inner Elliott Bay. While there is a small fishery for other species (see Appendix H, Table H-2), most fish caught in the project area are salmonids. Fishing activities correspond with migration times of the various species (Table 7-3). Coordination with and avoidance of conflict with treaty commercial fisheries would be assured by protocols and agreements to be put in place. After the pipeline is laid, it would be covered with riprap then recovered with excavated bay sediments and/or sand. Treaty commercial fishery net entanglement would be eliminated. Potential impacts to threatened species will be determined through conference with NMFS; construction related impacts are not anticipated.

Shellfish. Construction of new or expanded wastewater discharge outfalls in marine waters is currently regulated by four state agencies: Ecology, WDFW, Washington State Department of Health (WDOH), and Washington Department of Natural Resources (WDNR). In a recent *Inter-Agency Permit Streamlining Agreement* (Ecology 1995), a newly coordinated approach to ensuring adequate protection to harvestable shellfish resources is outlined. However, since the WDOH would “not certify, approve, or recommend the harvesting of any shellfish within Inner or Outer Elliott Bay, regardless of the existence of” the Elliott West Outfall and outfall extension, no shellfish inventory or mitigation plan would be required for the project (Meriwether 1997).

Table 7-3

Migration Times for Adult Salmonids Found in the Project Area

Species	Migration Season
Chinook salmon	July-August
Coho salmon	September-October
Chum salmon	October
Steelhead	December

Source: Hage 1996.

No large populations of shellfish (e.g., geoducks) have been identified thus far in the vicinity of the proposed pipeline (refer to section 4.5.1). Impacts to smaller benthic populations and communities could include displacement along the pipeline corridor from MLLW -0 to MLLW - 60 both for the Denny Way CSO Outfall Extension and Elliott West Outfall. The total area affected is estimated to be between 0.7 and 0.9 acres.

Construction would require construction through intertidal and subtidal habitats as well as the existing Denny Way Sediment Cap. Increased turbidity and potential contaminant release into the water column associated with construction could have short-term adverse impacts on species inhabiting the area, such as crab or shrimp. Benthic organisms are expected to re-colonize the pipeline corridor following completion of construction, similar to re-colonization that occurred at the Denny Way Sediment Cap (Romberg et.al. 1995a).

Conveyance and Regulating Structures

With the exception of portals and dewatering sites, no adverse or beneficial impacts to plants, wildlife, fishery or shellfish resources are anticipated to occur under Alternative 1 during construction of the pipelines. Please refer to the discussion of overall project impacts under the Outfalls section above.

CSO Control

Construction of CSO control facilities would not result in any impacts to Elliott Bay fishery or shellfish resources because these facilities are on the Elliott West site and not adjacent to a waterbody. Please refer to the discussion of overall project impacts under the Outfalls section above.

Plants, Wildlife and Habitat. With the exception of portals and dewatering sites, no impacts to plants and animals are anticipated to occur under Alternative 1 during construction of the new Mercer Street Tunnel. This facility would be largely constructed underground. Preliminary design of the tunnel indicates that it would be sufficiently deep to avoid cutting the roots of street trees. Construction of the West Tunnel Portal would not require removal of substantial amounts of vegetation, as portal excavation would occur on the Elliott West site, which has been previously disturbed and contains little native vegetation. Construction of the Elliott West Effluent Pipeline and the Elliott West CSO Pipeline would likely result in removal of lawn grasses, ornamental shrubs and small trees planted within Myrtle Edwards Park. Although enjoyed for their aesthetic value by park users, the majority of the plants in Myrtle Edwards Park are non-native plants that provide limited value for urban wildlife habitat.

Construction of conveyance facilities in the Elliott Bay Subbasin would likely result in little temporary disturbance to urban wildlife and wildlife habitat. Most of these facilities are located in or under existing roadways. Pigeons, gulls, starlings, and crows, which commonly occur in Myrtle Edwards Park, may be affected during trenching of the force main and CSO pipeline. Pigeon is the main food supply for peregrine falcon residing within the City of Seattle. Temporary disruption to pigeon feeding patterns along the railroad tracks near the grain terminal may result in minor disruption of foraging patterns for peregrine falcon in the area. Neither bald eagle or marbled murrelet are anticipated to be affected by construction of conveyance facilities. A small number of shrubs and invasive plants would likely be removed from the Elliott West site during development of the West Tunnel Portal and Elliott West CSO Control Facility. Plant species occurring on this site include butterfly bush, Scot's broom, and Himalayan blackberry. The majority of this site is covered with asphalt and slabs of old concrete. Earlier investigations undertaken by King County indicate that although surface water ponding occurs on the Elliott West site during the winter, the site does not meet criteria to classify it as a jurisdictional "wetland" (Watkins 1996a). Ducks and Canada geese occasionally use ponded water on the West Tunnel Portal and Elliott West site during the wet, winter season. Waterfowl would be displaced from use of this site during construction of the Elliott West CSO Control Facility. It is assumed that waterfowl would use adjacent waterbodies, such as Elliott Bay or local fresh waterbodies, in place of this site for foraging and resting.

7.4.2 Alternative 2 - Partial Separation and Storage

Outfalls

The four Elliott Bay Stormwater Outfalls proposed under this alternative would be located along the shoreline below the MLLW mark. These stormwater outfalls would be situated so that the natural beach located approximately 500 feet north of the existing Denny Way CSO would be avoided. These four outfalls would be placed close to or on the riprap-lined shore below the MLLW mark.

Plants, Wildlife and Habitat. No adverse impacts to aquatic vegetation are likely due to construction of these stormwater outfalls. Minor impacts to park vegetation (e.g., lawn, trees, and shrubs) would likely occur on shore during trenching. Construction of these four outfalls is not likely to significantly interrupt marine mammal or waterfowl activity along the shoreline. In-water construction of the stormwater outfalls is anticipated to take two months. Possible impacts to wildlife within the onshore park environment are similar to those described for outfalls under Alternative 1.

Fisheries. Construction of four stormwater outfalls is not expected to result in significant impacts to fish habitat and species present in the nearshore environment of Elliott Bay since the outfalls would overflow on the beach so little in-water construction would be required. Much of the existing shoreline consists of steeply-sloped riprap, providing little natural habitat for fish species. While some temporary sedimentation of nearshore waters could occur in the immediate vicinity of each outfall, construction methods would include erosion control to minimize sedimentation. Construction would comply with WDFW HPA permit requirements to minimize impacts to fish. Permit requirements would likely include avoidance of construction during juvenile salmonid out migration periods. No significant impacts to tribal and recreational fishing activities would occur. Construction would be temporary and only disrupt onshore fishing activities in the immediate

vicinity of each outfall. Construction would not occur during the juvenile salmonid out-migration period from mid-March to mid-June, avoiding potential impacts to juvenile salmonids.

Shellfish. Construction impacts would include displacement and/or loss of macroinvertebrate species, such as mussels, barnacles, and anemones, inhabiting the shoreline areas within Myrtle Edwards and Elliott Bay parks. Stormwater outfalls would be buried on shore and would terminate below the extreme low water mark. Because four new outfalls would be constructed in the shoreline area, there would be a potential for increased nearshore habitat disruption compared to Alternative 1. In all other aspects, impacts would be similar to Alternative 1.

Conveyance

Construction of conveyance facilities would not result in any impact to Elliott Bay fishery or shellfish resources. Please refer to the discussion of overall project impacts under the Outfall section above. No significant impacts to plants, wildlife and habitat are anticipated to occur under Alternative 2 during construction of the Elliott Bay Stormwater pipelines. The 14 miles of proposed stormwater pipes would be located primarily within existing roadways and arterials. Construction of the Elliott Avenue Pipeline would result in removal of some vegetation within Myrtle Edwards Park. Similar to the Alternative 1, construction of conveyance facilities for Alternative 2 in the Elliott Bay Subbasin would likely result in little impact to urban wildlife and wildlife habitat. Most of these facilities are located in or under existing roadways (see Alternative 1).

Regulating Structures

No adverse or beneficial impacts to plants, wildlife, fishery or shellfish resources are anticipated during construction of regulating structures under this alternative.

CSO Control

Construction of CSO control facilities would not result in any impact to Elliott Bay fishery or shellfish resources because the Elliott West site is not adjacent to any waterbody. Please refer to the discussion of overall project impacts under the Outfall section above. Impacts from developing the Denny CSO Control Facility are similar, but less significant than impacts described under Alternative 1 for the Elliott West CSO Control Facility. The Mercer Street Tunnel and West Tunnel Portal would not be constructed under this alternative.

7.5 ENERGY

Impacts to energy resources would be similar for Alternatives 1 and 2. The CSO control facility on the Elliott West site would use the most energy. Although no comparable facility currently exists within the system, the closest type of facility is the Carkeek facility. The annual energy usage at Carkeek is 2,500,000 kilowatt hours. The differences include intermittent versus continuous use, different pumping head requirements, and pump sizes. Thus, it is estimated that the CSO control facility on the Elliott West site would use about 85,000 kilowatt hours on an annual basis. This is due to larger pumps that would be required for the Denny/Lake Union Project. There would be short-term energy impacts during construction of the Elliott Bay Subbasin facilities. At some locations, electrical energy could be

used to operate construction equipment such as dewatering pumps, generators, fans, or lighting. Other construction equipment would be fueled by diesel or gasoline. Alternative 2 would use more electricity and fuels because of the extensive amount of pipes required.

7.6 ENVIRONMENTAL HEALTH

7.6.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Construction in the vicinity of the Denny Way CSO Outfall Extension and Elliott West Outfall would likely encounter the Denny Way Sediment Cap located just offshore from the present outfall. This cap, consisting of a three foot-thick layer of sand covering an area of 3 acres, was developed to contain contaminated bottom sediments in the area and to prevent contact by humans and aquatic life. Contaminants confined by the cap include total organic carbon, mercury, silver, bis-phthalate, and PCBs. Construction of outfalls would require pilings placed through the capped area. The use of pilings to support the outfalls would minimize the disturbance of the sediment cap and contaminated sediments. Disturbance of the sand sediment cap and underlying sediments during construction could expose workers operating construction equipment to contaminants and could re-suspend contaminated sediments in the bay, thus increasing the potential for contact with recreational users of the bay as well as aquatic life. Outfall construction would occur over a one year period and would comply with both PSDDA Dredged Material Evaluation Procedures (COE et.al. 1988), as well as requirements of the NOAA Consent Decree (Brown and Caldwell and KCWPC 1996). Transportation-related spills of fuels, solvents, oil, lubricants, and other construction-related substances from boats associated with offshore outfall construction also could occur. However, because of the small number of boats involved in transporting hazardous materials to the outfall construction area, this risk is low, and no significant impacts would be expected.

Conveyance, Regulating Structures, and CSO Control

Construction-related impacts for these facilities are similar to those described for the South Lake Union Subbasin (refer to Section 5.7.1). A Dechlorination Pipeline would carry sodium bisulfite from storage at the Elliott West site to the effluent outfall pipe. A leak or break in this pipeline could release chemicals into Myrtle Edwards Park. Within the Elliott Bay Subbasin, potential human exposure to contaminants would be greatest during construction in Myrtle Edwards Park. The construction area would be isolated from potential pedestrian access to minimize opportunities for contact with sewage or other hazardous materials.

7.6.2 Alternative 2 - Partial Separation and Storage

Impacts are largely the same as those described for Alternative 1. Because there would be more in-street construction for conveyance pipelines compared to Alternative 1, there may be a greater potential for human contact with sewage or other hazardous materials.

7.7 NOISE

Noise levels would temporarily increase during construction of the facilities proposed for either Alternative 1 or 2. Construction duration would vary by facility and by alternative (see Table 7-1). Construction noise would typically be more noticeable during the nighttime (10 p.m. - 7 am) and in areas where background noise levels are low (i.e., parks, residential areas).

7.7.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Typical trench excavation methods which generate noise levels ranging from 80-85 dBA at a distance of 50 feet would be utilized onshore to construct the force main and the tie-in to the new outfalls. Pile driving would be required within Myrtle Edwards Park and the upper intertidal area to support the outfall facilities and would be completed in approximately one month. Construction noise would be most noticeable to users of Myrtle Edwards Park. Noise generated during construction of the offshore portion of the outfalls would also be noticeable to park users. Offshore construction equipment would generate noise levels similar to onshore equipment (see Table 5-3).

Conveyance

Noise impacts from the construction of the Elliott West Effluent Pipeline and the Elliott West CSO Pipeline would be similar to the impacts from construction of the conveyance facilities described for the South Lake Union Subbasin. Construction generated noise would mainly impact users of Myrtle Edwards Park rather than businesses.

Regulating Structures

Construction of the Denny Way Diversion Structure in Myrtle Edwards Park would be most noticeable to park users. Noise generated by construction equipment would be similar to that described for the outfalls and would last approximately four months.

CSO Control

Excavation of the West Tunnel Portal would utilize construction equipment which would generate noise levels ranging from 80 to 85 dBA at a distance of 50 feet. If impact pile drivers are used, they could generate peak noise levels up to 101 dBA. Ventilator fans utilized during construction of the tunnel would operate at the portal approximately 8-18 hours per day. The ventilator fans could generate noise levels ranging from 85 to 110 dBA. Noise from tunneling activity would not be noticeable at the surface. Spoils removal and material delivery from the portal would generate truck traffic. Noise from heavy trucks would range from 80 dBA to 85 dBA at the roadside edge. This would not be significant during daytime hours when ambient noise levels are relatively high. The closest residences to the Elliott West site are approximately 500 feet to the east. Construction noise would be most noticeable at night (10 p.m. to 7 a.m.) when ambient noise levels are relatively low.

Construction of the Elliott West CSO Control Facility and West Tunnel Portal would generate noise levels from construction equipment similar to those described for the South Lake Union Subbasin. Construction noise would be most noticeable to users of Myrtle Edwards and Elliott Bay parks and some businesses along Elliott Avenue. The area is currently subject to a substantial amount of traffic noise. There are no residences immediately adjacent to the site which would be impacted by construction-related noise.

7.7.2 Alternative 2 - Partial Separation and Storage

Outfalls

Construction of the four new stormwater outfalls would temporarily increase noise levels in Myrtle Edwards and Elliott Bay parks. Impacts would be similar to those discussed for Alternative 1.

Conveyance

Short-term noise impacts during construction of 14 miles of stormwater pipeline in the Elliott Bay Subbasin would be similar to those described in Chapter 5 for the South Lake Union Subbasin. Short-term noise impacts during construction of the Elliott Avenue Pipeline would be the same as described for the Elliott West CSO Pipeline under Alternative 1.

Regulating Structures

Short-term noise impacts from construction of the Denny Way Diversion Structure are the same as described for Alternative 1.

CSO Control

Noise impacts from construction of the CSO control facilities on the Elliott West site would be similar to those described for Alternative 1. The total construction duration would be approximately the same although the facilities are different sizes.

7.8 LAND AND SHORELINE USE

All proposed Elliott Bay Subbasin facilities under Alternatives 1 and 2 would be constructed underground except for the facilities at the Elliott West site. Construction impacts (e.g., dust, truck traffic, noise, visual changes) would impact adjacent land uses. However, most of the adjacent land uses are commercial/industrial which would not be impacted as readily as residential land uses, which are located on the bluff above the Elliott West site, since the Elliott Avenue corridor currently has high traffic and noise levels. Adjacent businesses could experience temporary access impacts during construction. In addition, construction impacts are short term. Before construction, all applicable shoreline, land use, zoning, and construction permits would be acquired by King County and Seattle (see Permits section under 1.14 and Table 1-4 for a list of probable permits required by the project). Work on the new effluent outfall, outfall extension, and regulating structures in Myrtle Edwards Park would be the only Elliott Bay Subbasin facilities in Alternative 1 within the state shoreline zone of 200 feet from a waterbody and would require a shoreline permit. Alternative 2 would have stormwater outfalls that would require a shoreline permit.

Street Vacation of West Mercer Street

Construction of the Elliott West CSO Control Facility for Alternative 1 and the Denny CSO Control Facility for Alternative 2 could require a street vacation of the west end of West Mercer Street (0.522 acres). The street right-of-way (ROW) is located in the middle of the Elliott West site and it would require additional piping and costs to design the CSO control facility around the ROW. Also, development within the street ROW provides for a more compact facility.

Vacation of the West Mercer Street public ROW on the Elliott West site would have no adverse impacts on the public trust functions of circulation, access, utilities, light, air, open space, or view. The site is not currently utilized for vehicular, bicycle, or pedestrian circulation systems or access to such circulation systems. Myrtle Edwards Park is located west of the Elliott West site, however the location of the railroad tracks would prevent the future extension of West Mercer Street through to Myrtle Edwards Park.

The Elliott West site is currently zoned commercial/industrial. Vacation of the ROW would enable it to be utilized for construction of CSO control facilities for the Denny Way project. The project elements proposed for the vacation area would be consistent with existing land use policies (i.e., land use designations would not change) and would be compatible with existing or future industrial development in the area. The ROW does not contain utility lines or facilities. No easements, restrictive covenants or relocation agreements would need to be executed prior to the vacation.

As required by Seattle Street Vacation policies, the CSO control facilities would not impact the access to sun, light and air circulation provided to pedestrians, bicyclists, vehicle occupants, and abutting properties. The facilities would be mostly below ground so there would be minimal shadow impacts to abutting properties. The ROW is not identified as protected view right-of-way. Residences to the east of the site on Elliott Avenue do have views of the water when double-decker container train cars are not sitting on the railroad tracks, however, the facilities constructed on the site would not significantly impact the existing view (refer to Section 7.10 Aesthetics for a discussion of aesthetic impacts of the project). The site currently does not contribute to any open space areas. The closest park is Myrtle Edwards Park to the west, which is separated from the site by the railroad tracks.

Vacation of the ROW would provide long-term public benefits. Facilities constructed on the site would be beneficial to the environment by decreasing CSO discharges into Elliott Bay and move the existing outfall off shore. This decrease would improve water quality and underwater, which would enhance the recreational qualities of Myrtle Edwards Park.

7.9 RECREATION

The bicycle trail through Myrtle Edwards Park would be temporarily rerouted during construction of Alternatives 1 and 2 pipelines connecting the force main and the transition structure. The pedestrian pathway would remain open and a portion would serve as a detour for the bicycle trail. Construction vehicles would access the onshore construction activities within Myrtle Edwards Park from the parking lot at the south end of the park. Some vehicular parking within the lot may be temporarily displaced. Trucks would proceed to the construction site along the bicycle trail within the park. Other shoreline activities in the vicinity of the outfalls and the diversion structure would also be temporarily disrupted during construction. King County is coordinating access, restoration, and parks use with Seattle Department of Parks and Recreation (Appendix V).

7.10 AESTHETICS

Currently, views of the downtown Seattle skyline, West Seattle, Elliott Bay, the Kitsap Peninsula, and the Olympic Mountains are the principal visual amenities in the proposed Elliott Bay project area. Views are influenced by development patterns and topography. Urban design elements are discussed under Section 7.11 Historical and Cultural Preservation. Except for the Elliott West site, all Elliott Bay Subbasin facilities for Alternatives 1 and 2 would be constructed entirely below grade. Most of the Elliott West site facilities would be partially above ground and would take about three years to construct. During construction, aesthetic qualities in vicinity would be temporarily degraded due to dust, noise, and movement of construction vehicles.

7.11 HISTORICAL AND CULTURAL PRESERVATION

7.11.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

No impacts to historic structures or hunter-fisher-gatherer archaeological resources are expected from outfall construction, however, one shipwreck was identified within 800 feet of the existing Denny Way CSO and may be adversely affected by construction of the outfall. One urban design element, Myrtle Edwards Park, also may be adversely affected through modification of the viewscape during construction. The outfalls would be excavated in contemporary Elliott Bay tideflats and offshore deposits. At least part of the excavation would be in fill material, some probably deposited in the area during the Denny Regrade operations. The proposed outfalls are west of wharves and other facilities which appear on an 1893 Sanborn Fire Insurance map (Sanborn Map and Publishing Company 1893)

(see Appendix M). Most of the historic wharves and associated structures were in the right-of-way of contemporary Elliott Avenue West, indicating a low probability for historic archaeological resources along the shoreline. If the Elliott West Outfall is microtunneled from the Elliott West site to the current discharge location, the urban design element would not be adversely affected. No historic structures are recorded in the vicinity of the outfalls.

Conveyance

No adverse effects are expected for significant or potentially significant historic structures, or for hunter-fisher-gatherer and historic archaeological deposits from construction of the pipelines alignment in the Alaskan Way right-of-way. No significant or potentially significant historic structures are recorded near the Alaskan Way right-of-way pipelines alignment. This alignment would be excavated in fill material which was placed on or near the historic Elliott Bay tideflats. Even if the alignment was excavated through the fill, it is unlikely that archaeological deposits would be encountered. The alignment would be in the former tideflats and offshore deposits which were west of the former shoreline of Elliott Bay, formed by a bluff line and a beach below the bluff. The southern portion of the pipelines would be west of wharves which appear on 1893 Sanborn Fire Insurance maps for the area (Sanborn Map and Publishing Company 1893). The area was filled sometime after 1893, probably during the Denny Regrade. The proposed pipelines alignment in the Alaskan Way right-of-way appear to be too far west of the former Elliott Bay shoreline to have pilings or other remnants of early historic wharves.

Regulating Structures

No impacts to historic structures, or hunter-fisher-gatherer and/or historic archaeological deposits are expected from construction of the diversion structure. Waterfront views from Myrtle Edwards Park, an urban design element, may be adversely affected during construction. No significant or potentially significant historic structures are recorded in the vicinity of the proposed diversion structure or the Elliott Bay Interceptor Control Structure. Both facilities would be excavated in fill material which has been placed on the former tideflats of Elliott Bay. The diversion structure would be in the general vicinity of lumber mill wharves and a creosoting works that appear on an 1893 Sanborn Fire Insurance map (Sanborn Map and Publishing Company 1893). The wharves were west of First Avenue West, between West Denny Way and West John Street. The proposed structure is probably too far west of the former bluff line and wharf complex to retain any pilings or other structural evidence of the historic buildings.

CSO Control

Mercer Street Tunnel. Historic structures and undiscovered hunter-fisher-gatherer and/or historic archaeological resources may be adversely affected by tunnel construction. Two historic structures are at the contemporary ground surface above the tunnel and may meet Seattle City Landmarks designation or NRHP criteria (Table 7-4): the Marqueen Apartments at the corner of Queen Anne Avenue North and West Mercer Street and a residence at First Avenue West near the intersection with West Mercer Street. The structures may be affected by ground settling during tunneling operations and/or vibrations from the tunneling equipment (Hansen 1996).

The west end of the tunnel excavation may intersect a contact between fill and the historic period beach surface, approximately 50 to 60 feet west of the former bluff base on the Elliott Bay shoreline. Archaeological deposits may have been buried on former beach surfaces due to sea level rise and/or subsidence during an earthquake. Historic archaeological deposits and pilings associated with wharves shown on the 1893 Sanborn Fire Insurance Map may occur at the west end of the tunnel (Sanborn Map and Publishing Company 1983). There is a low to high probability for buried hunter-fisher-gatherer archaeological deposits at the west end of the tunnel, depending on the inundation and ground subsidence history of the area.

Table 7-4
Elliott Bay Subbasin
Historic Structures Which May Be Adversely Affected

Proposed Alternative	Property/Landmark Name	Location (Queen Anne/Seattle Center area)	Evaluation Status
1,2	Residence	515-517 First Ave West	Possibly eligible as SCLD/HSPDA
2	T. Duncan Building	550 Mercer St & 557 Roy St	Possibly eligible as SCLD
1,2	The Marqueen Apartments	600 Queen Anne Ave North	Possibly eligible as SCLD (Community Significance)

SCLD - Seattle City Landmark Designation

HSPDA - 1975 Historic Seattle Preservation and Development Authority Inventory

Elliott West CSO Control Facility and West Tunnel Portal. No impacts to historic structures are expected, however, hunter-fisher-gatherer and historic archaeological resources may be adversely affected. No significant or potentially-significant historic structures are recorded near the proposed facilities on the Elliott West site. The proposed facilities would be excavated through fill which was placed on the tideflats of Elliott Bay. Old shoreline maps (Bortleson et al. 1980) and an 1893 Sanborn Fire Insurance map (Sanborn Map and Publishing Company 1893) show the former shoreline east of what is now Elliott Avenue West. The proposed facilities are west of structures which were mapped near the west end of West Mercer Street (Sanborn Map and Publishing Company 1893). The CSO structure will intersect the contact between fill material and old beach deposits at a depth of approximately 25 feet below ground surface (Brown and Caldwell and KCWPC 1996). The east edge of the structure will be approximately 120 feet west of the historic period Elliott Bay shoreline at the base of a bluff. There is a low to moderate probability for buried hunter-fisher-gatherer archaeological deposits, depending on the inundation and subsidence history of the area.

7.11.2 Alternative 2 - Partial Separation and Storage

Outfalls

No significant or potentially-significant historic structures have been recorded in the vicinity of the proposed stormwater outfalls. No impacts to significant or potentially-significant historic structures are expected, and no historic or hunter-fisher-gatherer archaeological deposits should be adversely affected. Construction in Myrtle Edwards Park may adversely affect waterfront views that led to the park's designation as an urban design element by the HSPDA. The West Denny Way, West Thomas Street, and West Republican Street outfalls would be in fill material in Myrtle Edwards Park. The Cedar Street outfall would be at Pier 69 on the waterfront. Manning's Wharf is plotted between Vine Street and Wall Street at Railroad Avenue (now Alaskan Way) on the 1888 Sanborn Fire Insurance map (Sanborn Map and Publishing Company 1888), southwest of the proposed Cedar Street outfall. By 1893, the wharf had expanded northward and Railroad Avenue (Alaskan Way) was much wider (Sanborn Map and Publishing Company 1893). The wharf was southwest of the intersection of Cedar Street and Railroad Avenue (Alaskan Way). The proposed outfall would be north and west of the historic wharf. Nearshore construction excavation would be primarily in fill material which was placed west of the former shoreline of Elliott Bay. It is unlikely that historic materials along the contemporary shoreline of Myrtle Edwards Park would be affected because the shoreline is too far west of the early historic period shoreline of Elliott Bay. Pilings and other materials associated with early wharves in the area (Sanborn Map and Publishing Company 1893) were east of the contemporary shoreline, in the vicinity of Elliott Avenue West and would not be affected.

Conveyance

The Elliott Avenue Pipeline would have the same impacts as Alternative 1. Sixty-six potentially significant historic properties, 26 properties which have been evaluated as significant, and eight urban design elements, may be adversely affected. The proposed street rights-of-way would be in the Queen Anne/Seattle Center, Elliott Bay, and Downtown neighborhood areas. Potential impacts can be estimated in a general way by noting the number of recorded historic structures in each neighborhood and their potential significance (see Appendix L). Two properties in the Queen Anne/Seattle Center neighborhood are listed on the National Register of Historic Places, five are listed on the National Register of Historic Places and are Seattle City Landmarks, and one property is listed on the Washington Heritage Register. Forty-one properties are possibly eligible for Seattle City Landmark designation, three are urban design elements, and five properties have been officially designated as Seattle City Landmarks. The Downtown neighborhood has one property listed on the National Register of Historic Places, nine properties listed on the National Register of Historic Places and designated as Seattle City Landmarks, and three properties designated as Seattle City Landmarks. Twenty inventoried structures may be eligible for designation as Seattle City Landmarks. The Elliott Bay neighborhood has five properties which are possibly eligible as Seattle City Landmarks and five urban design elements. Historic structures could be adversely affected by ground settling adjacent to open cut pipeline trenches and/or damage from vibrations caused by operation of construction equipment (Hansen 1996). Views of some urban design elements may be adversely affected during construction. Some buildings that are urban design elements may be adversely affected by ground settling adjacent to open cut pipeline trenches and/or damage from vibrations caused by operation of construction equipment (Hansen 1996).

Regulating Structures

Same as Alternative 1.

CSO Control

The proposed facility would be in the same area as described for the Elliott West CSO Control Facility in Alternative 1. No potentially significant historic structures are near the Elliott West site. There is a low to moderate probability for hunter-fisher-gatherer deposits on the east side of the site. The proposed facilities would be in the same area as described for Alternative 1 and would include some of the same components. The storage tank would be smaller than that proposed for Alternative 1. The proposed control facility would be west of the former shoreline of Elliott Bay in what were once tideflats. No historic structures appear in the vicinity on the 1893 Sanborn Fire Insurance map of the area (Sanborn Map and Publishing Company 1893) and no significant historic structures are recorded near the proposed CSO control facility. Potential impacts to hunter-fisher-gatherer resources would be the same for as Alternative 1.

7.12 TRANSPORTATION

Short-term transportation impacts during construction could include increased traffic congestion due to construction detours and additional truck and worker trips, temporary lane closures, displaced street parking, and disrupted vehicular access to adjacent properties. Table 7-5 shows the estimated construction duration in days, worker trips per day, and average and maximum daily truck trips for each Elliott Bay Subbasin facility. There could also be short-term impacts to marine, rail and bicycle traffic.

Traffic in the Elliott Bay Subbasin is typically congested, and construction activity could significantly impact the existing traffic situation on several major arterials. Impacts would vary depending on timing and duration of construction activity, size and capacity of affected streets, and the projected volume of construction traffic. It is estimated that the projected volume of construction traffic would be about 1 percent more than the average daily traffic on any of the affected arterial roadways. The majority of the construction related traffic would utilize Elliott Avenue West, Alaskan Way and Denny Way.

7.12.1 Alternative 1 - CSO Storage and Treatment (The Preferred Alternative)

Projected construction related trips for Alternative 1 in the Elliott Bay Subbasin are presented in Table 7-6. All trips are given as roundtrips (i.e., to and from site equals one roundtrip). During peak construction, construction traffic would increase traffic on Elliott Avenue West by approximately one percent.

Table 7-5
Elliott Bay Subbasin
Estimated Construction Duration, Workers and Truck Trips
(in roundtrips)

Alternative 1 - CSO Storage and Treatment

	Outfalls¹		Conveyance²		Regulating³		CSO Control⁴	
Construction Duration	80 Workdays (4 months)		160 Workdays (8 months)		90 Workdays (4 months)		800 Workdays (34 months)	
Workers	30/Day		15/Day		10/Day		55/Day	
Truck Trips	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Dump Trucks	18	40	3	9	2	4	19	50
Concrete Trucks	1	5	1	5	5	14	3	54
Delivery Trucks	<1	4	<1	4	<1	4	4	10

Alternative 2 - Partial Separation and Storage

	Outfalls⁵		Conveyance⁶		Regulating⁷		CSO Control⁸	
Construction Duration	50 Workdays (2 months)		850 Workdays (40 months)		90 Workdays (4 months)		1,000 Workdays (46 months)	
Workers	5/Day		35/Day		10/Day		50/Day	
Truck Trips	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Dump Trucks	2	9	3	9	2	4	19	50
Concrete Trucks	1	5	2	19	1	5	3	54
Delivery Trucks	<1	3	<1	4	<1	4	4	10

¹ Includes Elliott West Outfall and Denny Way CSO Outfall Extension.

² Includes Elliott West Effluent Pipeline and Elliott West CSO Pipeline.

³ Includes Denny Way Diversion Structure and Elliott Bay Interceptor Control Structure.

⁴ Includes Mercer Street Tunnel, West Tunnel Portal, Tunnel Effluent Channel, Influent Pump Station, Chemical Storage and Feed Facility.

⁵ Includes Elliott Bay Stormwater Outfalls.

⁶ Includes Elliott Bay Stormwater Pipelines and Elliott Avenue Pipeline.

⁷ Includes Denny Way Diversion Structure.

⁸ Includes Storage Tank, Influent Pump Station, and Effluent Pump Station.

Table 7-6
Alternative 1 - CSO Storage and Treatment
Elliott Bay Subbasin Truck Trips¹
(in roundtrips)

	Outfalls²	Conveyance³	Regulating⁴	CSO Control⁵	TOTALS
Construction					
Dump Trucks	670	4005	55	9945	14,675
Concrete Trucks	83	4257	72	3375	7,787
Delivery Trucks	86	777	0	1500	2,363
Total Truck Trips	840	9,039	127	14,820	24,826
Worker Trips	2400	2400	900	44,000	49,700
Total Roundtrips During Construction	3,240	11,439	1,027	58,820	74,526
Operation	0	0	1/month	9/month	10/month

¹ Truck trips are based on all materials moved for the project including concrete, pipes, etc. Size of truckloads used are: 18 CY seventy-five percent of the dump truck trips and 9 CY for twenty-five percent of the dump truck trips; 8 CY for concrete; 24" pipe - 5 per truckload; 36" pipe - 4 per truckload; 48" pipe - 3 per truckload; 60"+ - 1 per truckload; and 10 50-foot pilings per truckload.

² Includes Elliott West Outfall and Denny Way CSO Outfall Extension.

³ Includes Elliott West Effluent Pipeline and Elliott West CSO Pipeline.

⁴ Includes Denny Way Diversion Structure.

⁵ Includes Mercer Street Tunnel, West Tunnel Portal, Storage Facility and Pump Stations.

Outfalls

During offshore construction of the two outfalls, marine traffic within Elliott Bay could be impacted. Construction activity would occur south of the major berthing area for Terminal 91 and within the southern portion of the anchorage area for Terminal 86. During construction, commercial and recreational traffic utilizing this portion of Elliott Bay would have to navigate around construction-support vessels.

Conveyance

Most of the Elliott West Effluent Pipeline and Elliott West CSO Pipeline would be constructed outside Myrtle Edwards Park and west of the Burlington Northern/Santa Fe rail lines in the Alaskan Way right-of-way. The last hundred feet would cross the bicycle and pedestrian trail in Myrtle Edwards Park to connect to the outfalls. Bicycle and pedestrian traffic would be temporarily disrupted and rerouted during construction of the conveyance system. The portion of the Elliott West CSO Pipeline that crosses under the Burlington Northern/Santa Fe rail lines would be bored and jacked to avoid impacting rail traffic. See Table 7-6 for truck trip information.

Regulating Structures

Traffic impacts from construction of the Denny Way Diversion Structure would be relatively minor. Temporary detours of the bicycle trail would be necessary.

CSO Control

Construction staging for the Mercer Street Tunnel and West Tunnel Portal would occur at the Elliott West site. Construction of the storage/treatment facility and pump stations would most likely be staggered so staging for all facilities could be accommodated at the Elliott West site. Daily truck trips from the Elliott West site would average approximately 25 truck trips per day for 38 months. There could be temporary lane closures on Elliott Avenue West during construction and it may be necessary for flaggers to temporarily control traffic when construction vehicles enter and exit the Elliott West site. The sidewalk on the west side of Elliott Avenue West would be closed during construction.

7.12.2 Alternative 2 - Partial Separation and Storage

Projected construction related trips for Alternative 2 in the Elliott Bay Subbasin are presented in Table 7-7. All trips are given as roundtrips (i.e., to and from site equals one roundtrip).

Outfalls

Construction of the new stormwater outfalls would generate approximately 500 truck trips.

Table 7-7
Alternative 2 - Partial Separation and Storage
Elliott Bay Subbasin Truck Trips¹
(in roundtrips)

	Outfalls²	Conveyance³	Regulating⁴	CSO Control⁵	TOTALS
Construction					
Dump Trucks	170	29,553	43	4481	32,247
Concrete Trucks	59	0	19	1375	1,453
Delivery Trucks	8	3325	0	69	3,402
Total Truck Trips	237	32,878	62	5,925	39,102
Worker Trips	250	29,750	900	50,000	80,900
Total Roundtrips During Construction	487	62,628	962	55,925	120,002
Operation	0	0	1/month	9/month	10/month

¹ Truck trips are based on all materials moved for the project including concrete, pipes, etc. Size of truckloads used are: 18 CY seventy-five percent of the dump truck trips and 9 CY for twenty-five percent of the dump truck trips; 8 CY for concrete; 24" pipe - 5 per truckload; 36" pipe - 4 per truckload, 48" pipe - 3 per truckload; 60"+ - 1 per truckload and 10 50-foot pilings per truckload.

² Includes Elliott Bay Stormwater Outfalls.

³ Includes Elliott Bay Stormwater Pipelines and Elliott Avenue Pipeline.

⁴ Includes Denny Way Diversion Structure.

⁵ Includes Denny CSO Control Facility storage tank and pump station.

Conveyance

Transportation impacts from construction of the Elliott Avenue Pipeline would be the same as described for the Elliott West CSO Pipeline under Alternative 1. Transportation impacts from construction of 14 miles of stormwater pipeline in the Elliott Bay Subbasin would be similar to those described in the South Lake Union Subbasin. Many local and residential streets throughout the subbasin would be temporarily disrupted during installation of the new stormwater pipe.

Regulating Structures

Transportation impacts from construction of the Denny Way Diversion Structure would be the same as described for Alternative 1.

CSO Control

Short-term construction impacts from construction of the pump stations at the Elliott West site would be the same as described for Alternative 1. The traffic impacts during construction of the storage tank at the Elliott West site would be similar to those described for the CSO control facilities in Alternative 1 except that less total truck trips would be generated by Alternative 2.

7.13 PUBLIC UTILITIES AND SERVICES

As described in the Affected Environment (Chapter 4) there are public utilities located throughout the Elliott Bay Subbasin which could be impacted during construction of the proposed facilities. The potential exists for accidental utility disruptions during construction, although measures would be taken to minimize these disruptions. Some of the conveyance facilities would make numerous utility crossings. There would be a greater likelihood of utility disruptions under Alternative 2 since more streets would be excavated to install the stormwater pipeline.

There is a high probability that the following utilities would need to be relocated:

- Existing 20-inch water line located north of West Mercer Street which services Magnolia.
- Communication duct on the north side of West Mercer Street.
- Overhead power lines in the vicinity of the West Tunnel Portal.

7.14 SOCIOECONOMICS

No minority or low-income populations would be disproportionately affected by construction of outfalls, conveyance, regulating structures, or control facilities. Census data for the Elliott Bay area indicate that there are no census tracts or blocks with minority populations exceeding 50 percent (see Chapter 4.0). Although average income levels are lower and the amount of assisted housing stock higher than citywide averages in the portion of the subbasin located south of Mercer Street, low-income populations would not be *disproportionately* affected by facility construction. Refer to the Socioeconomics section of Chapter 5 (5.14) for additional discussion of potential impacts to minority or low income populations.

7.14.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

The total project costs for all project components that would be constructed under Alternative 1 is an estimated \$161 million in 19976 dollars. A construction grant of \$35 million has been awarded to King County and Seattle for the project. The remainder of funding would come from sewer fees.

Outfalls

No significant socioeconomic impacts would be associated with construction of the proposed outfall and outfall extension. Construction would occur over seven months in and offshore of Myrtle Edwards Park and would not directly restrict access or otherwise result in impacts to area businesses. The presence of construction boats could temporarily discourage commercial boating activity in the area, but it is expected that such activity would temporarily re-locate to other portions of Elliott Bay. Outfall construction would create temporary, positive employment impacts. An estimated 30 workers would be required for 80 workdays to complete the project (see Table 7-5). No significant impacts to subsistence fish and shellfish harvesting by low income populations are anticipated during construction. Recreational shellfishing is prohibited on all Seattle public beaches (WAC 246-280). Non-sanctioned shellfishing that does occur is limited by lack of accessible beach area along the Elliott Bay shoreline area (refer to Section 4.4.4 Recreational Fishery). Although use statistics are not available, most fishing activity likely occurs on a public fishing pier just north of the grain terminal, but on occasion some fishing activity occurs from the rocks at Myrtle Edwards Park. Fishing activity on the pier is not anticipated to be affected by construction.

Conveyance and Regulating Structures

Construction of the proposed Elliott West CSO Pipeline would occur over approximately nine months; however, temporary access restrictions to businesses from the site of the proposed CSO control facility to Denny Way are not anticipated as this pipeline would be routed west of the existing railroad tracks, largely avoiding disruption of traffic or business activity along Elliott Avenue. In addition, any impacts would be temporary, and, as a result, would not be significant. Approximately 25 workers per day for a combined 250 workdays would be required for construction of conveyance and regulating structures (see Table 7-5). Employment impacts would be short term but positive.

CSO Control

Construction of the Elliott West CSO Control Facility would occur over a 46-month period. While the proposed site is vacant, there would be temporary impacts to businesses to the north and south of the site and in the vicinity along Elliott Avenue. In addition to the control facility, the site would be used as a staging area for the Mercer Street Tunnel. Increased truck traffic, noise, dust, and fumes could temporarily reduce patronage at area restaurants and retail businesses and could restrict ingress and egress from other businesses in the area. No businesses would be closed during construction. Rental or purchase of apartments or condominiums in the immediate vicinity of construction activities could also be temporarily affected by construction. King County and Seattle would closely coordinate with all affected businesses, residents and property owners to address concerns and mitigate impacts. Depending on final construction plans, some temporary acquisition of properties could be required for construction staging areas. While the extent and location of such areas has not been determined,

impacts would be temporary, similar to those discussed under Conveyance and Regulating Structures above. Approximately 55 workers would be employed over 800 workdays to construct CSO control facilities. Short-term employment impacts would be positive.

7.14.2 Alternative 2 - Partial Separation and Storage

The total project costs for all project components that would be constructed under Alternative 2 is an estimated \$309 million in 1997 dollars. A construction grant of \$35 million has been awarded to King County and Seattle for the project. The remainder of funding would come from sewer fees.

Outfalls

Under Alternative 2 four new stormwater outfalls would be constructed into Elliott Bay. An estimated 240 roundtrip truck trips and 250 worker roundtrips would be generated by construction. No significant impacts would occur as these facilities would be constructed in Myrtle Edwards Park and would not disrupt any business activity in the area. Approximately 5 workers per day would be employed over 50 workdays for outfall construction (see Table 7-5). Short-term employment impacts would be positive.

Conveyance and Regulating Structures

Construction of the proposed Elliott Bay stormwater pipelines would take up to 35 months. The excavation area includes high density retail, service, and residential areas; the Seattle Center; and a mix of single and multi-family residential areas on Queen Anne Hill. Much of the area, particularly in the vicinity of Western Avenue, Battery Street, Fourth Avenue North, and Virginia Street, experiences high volumes of traffic and has limited parking opportunities. The temporary restriction of ingress and egress in construction areas could impact businesses by disrupting the flow of goods and services and deterring patronage. However, construction would occur in sections, and the disruption of any one business would be of short duration. No businesses would be closed during construction; thus, no significant impacts are expected. Some temporary land acquisition could be required for the location of construction staging areas. The locations and area requirements of such staging areas would be determined after final construction plans were completed. It is anticipated that existing vacant properties would be used, and that properties would be available for development once construction was completed. As a result, no long-term loss in property development potential would occur. Approximately 35 workers would be employed for 900 workdays to construct conveyance and regulating structures. This would be a short-term employment benefit.

CSO Control

Short-term employment benefits would arise from employment of 50 workers for about 1,000 workdays.